

# Crystal Ball questions on acids and bases

*All of the following questions have not (as yet!) appeared in the NCEA Level 1 Exams*

1

Indicator	pH												
	1	2	3	4	5	6	7	8	9	10	11	12	13
Thymol blue	R	*	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
Bromocresol green	Y	Y	Y	*	B	B	B	B	B	B	B	B	B
Bromocresol purple	Y	Y	Y	Y	Y	*	V	V	V	V	V	V	V
Universal indicator	R	R	R	O	Y	Y	G	B	B	P	V	V	V
Alizarin yellow	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	*	V	V
Litmus	R	R	R	R	R	*	*	*	B	B	B	B	B

R = red, O = orange, G = green, B = blue, P = purple, Y = yellow and V = violet. \* = pH range (to the nearest whole number) when indicator is changing colour.

Discuss the advantages and disadvantages of the six different indicators listed in the table above.

2. Complete the table below

type of solution	stomach acid	pure water	oven cleaner
scientific name			
chemical formula			
pH range or number			
colour in Universal indicator			
sketch of a beaker showing $H^+$ and $OH^-$ ions of the solution			

3.

<i>Plant part</i>	<i>Colour of dye</i>		
	<i>In pure water</i>	<i>In acid solution</i>	<i>In alkali solution</i>
<b>Petals</b>			
Red hibiscus	Pink	Orange	Blue-green
Red oleander	Mauve	Pink	Green
Red rose	Pink	Pink	Olive-green
Red canna	Red	Orange	Dark-green
Red geranium	Red	Orange	Yellow
Red dahlia	Red	Orange-red	Amber
Mauve impatiens	Mauve	Pink	Green
Purple lasandra	Purple	Pink	Blue
Purple aster	Purple	Pink	Green
Yellow marigold	Yellow	Yellow	Yellow
Yellow dandelion	Yellow	Yellow	Yellow
Orange nasturtium	Orange	Yellow	Yellow
White rose	Colourless	Colourless	Amber
White daisy	Colourless	Colourless	Yellow
<b>Other parts</b>			
Red cabbage leaf	Purple	Pink	Green
Raw beetroot	Red	Red	Yellow
Green spinach leaf	Green	Yellow-green	Yellow-green

Many different plant parts can be used as indicators. Some plants and some plant parts are more useful than others, as can be seen by the different colours produced by the plants in pure water, acid and alkali. Discuss the use of plant parts as indicators.

4. The labels have fallen off the following solutions. Describe and explain clearly how to identify them in the laboratory. You may only use the solutions provided and litmus paper (red and/or blue).

sodium carbonate

sodium hydroxide

pure water

ethanoic acid

5. There are many different indigestion tablets that people can take to reduce the amount of stomach acid in their body. The active ingredient in antacids is either magnesium hydroxide or calcium carbonate.

Discuss, using equations the differences between taking an antacid containing either magnesium hydroxide or calcium carbonate.

6. A student reacted sulphuric acid with copper oxide to produce the salt, copper sulfate.



The equation contains some errors.

a) Rewrite the equation so that it is a correctly balanced chemical equation.

b) Discuss the reasons for the changes made to correctly balance the chemical equation.

7. Discuss in detail how to make zinc sulphate in the laboratory

8. Discuss in detail the effects of rainwater (carbonic acid,  $\text{H}_2\text{CO}_3$ ) on the limestone ( $\text{CaCO}_3$ ) caves at Waitomo.

9. Discuss the reaction between hydrochloric acid and calcium carbonate in detail